Which Airline is This? Airline Logo Detection in Real-World Weather Conditions

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Characteristics of Logo Detection

Logo Detection

- Used for checking visibility of advertisements, ...
- Mostly based on object detectors like Faster R-CNN
- Datasets feature clean images

Results of Faster R-CNN

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- What about real-world weather?

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Results of Faster R-CNN

We propose a new…

- … dataset with images captured in adverse weather conditions
- … system for airline logo detection $+$ learning free data augmentation strategy

Proposed Dataset

- Detection of airline logos on images from planespotters
- 7038 annotated airline logos - 41 classes

	Train	Val	Test1
Simple images	✓	✓	✓

Simple test split

Proposed Dataset

- Detection of airline logos on images from planespotters
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	Train	Val	Test1	Test2
Simple images	✓	✓	✓	
Difficult images				✓

Difficult images

- Only 252 images with 459 annotations
- Effected by adverse weather conditions
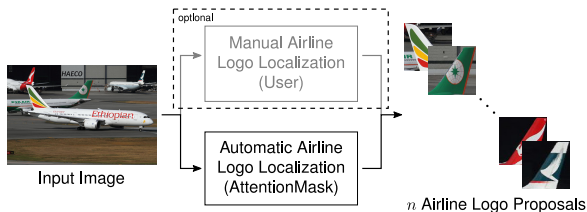

Simple test split

Difficult test split
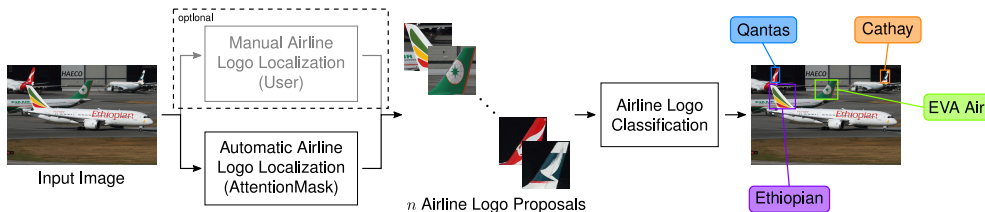
Airline Logo Detection System

Input Image

Airline Logo Detection System

optional

Manual Airline
Logo Localization
(User)

Automatic Airline
Logo Localization
(AttentionMask)

Input Image

n Airline Logo Proposals

Localization

- AttentionMask [Wilms and Frintrop, ACCV'18] for localizing logo proposals
- Can be provided by the user

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Classification

- Classifier based on VGG
- Optimized architecture
- Lightweight design with 7 layers

Data Augmentation for Adverse Weather Conditions

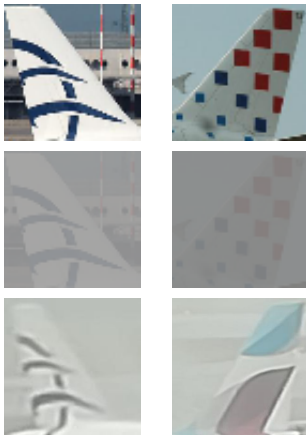**Fog**

Original simple images

Our augmentation on simple images
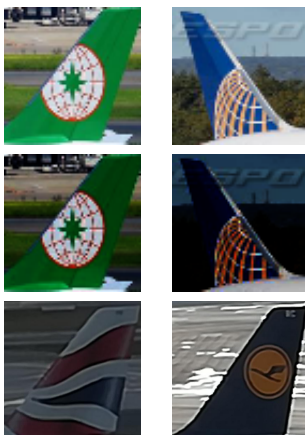

Original difficult images

Increase brightness

Data Augmentation for Adverse Weather Conditions
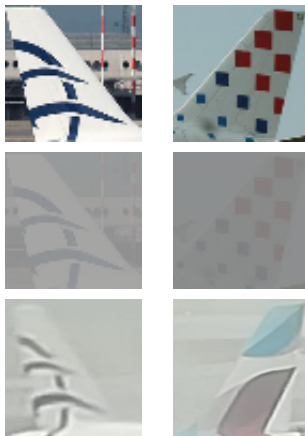
Fog

Increase brightness
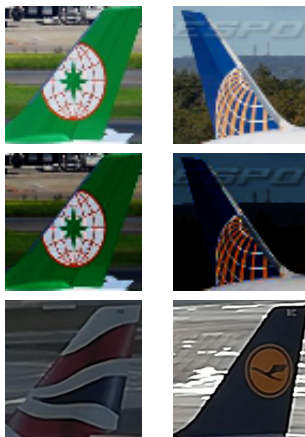
Rain/dark clouds

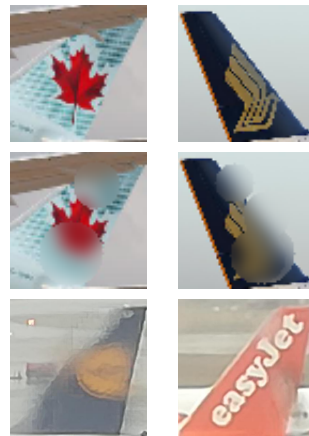Contrast reduction

Data Augmentation for Adverse Weather Conditions

Fog   **Rain/dark clouds**   **Raindrops**

Increase brightness   Contrast reduction   Local blurring

Results

Simple Test Split

Method	mAP	mAP$_{75}$
YOLOv3	0.698	0.869
Faster R-CNN	0.659	0.826
Ours	**0.708**	**0.880**

Faster R-CNN w/o DA

Ours w/o DA

Faster R-CNN [Ren et al., NIPS'15]   YOLOv3 [Redmond and Farhadi, arXiv'18]

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Difficult Test Split

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YOLOv3	0.101	0.129
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Difficult Test Split with our Data Augmentation

Method	mAP	mAP$_{75}$
YOLOv3	0.123	0.147
Faster R-CNN	0.128	0.117
Ours	**0.203**	**0.248**

Faster R-CNN [Ren et al., NIPS'15]   YOLOv3 [Redmond and Farhadi, arXiv'18]

Summary

- **Dataset** with adverse weather effects
- Tailored architecture for **airline logo detection system**
- **Data augmentation strategy** to counter adverse weather effects

Conclusion

- Tailored architecture works better than object detectors
- Adverse weather conditions have strong effect on the results
- Data augmentation improves the results

Ours with DA

Thank you for your attention!

Acknowledgement

We thank the administrators of planespotters.net for allowing us to use their database for this research.

Visit our poster in
session **PS T3.5** on **Wednesday**, 13 January

Los Angeles	**New York**	**CET**	**Beijing**	**Sydney**
07:30 am	10:30 am	04:30 pm	11:30 pm	02:30 am